

## FLEXIBLE DRINKING STRAW

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The invention relates to flexible straws [with one (or more) flexible zone (corrugated zone) consisting of folding rings (annular bellows folds, reentrant overlapping folds)] which are attached to the packaging of fruit juices, milks, 5 coffees etc. and are bent to take up less space.

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The straws used to date for this purpose have one flexible zone (corrugated zone) consisting of 8-10 folding rings (annular bellows folds, reentrant overlapping folds). 10 [The first (or the last) ring, being firm, is not counted as folding ring]. To bend to obtuse angles (e.g.  $180^\circ$ ) due to the restricted number of rings, continuous external pressure has to be exercised. This pressure keeps being exercised by the packaging material afterwards as well. As a result the rings 15 are permanently deformed and straightening of the straw is not possible. Also a problem is posed by the fact that all rings are expanded (unfolded) after bending of the straw. (e.g. The U-shaped straws.)

20 The present invention, by increasing the number of rings and keeping certain of the rings folded (contracted), succeeds in straightening the straw up again almost without any damage and in bending the straw to all directions. Further, it increases the effective length of the straw.

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Till now no one has thought to leave certain of the rings folded or simply to increase the number of rings so that they

are not deformed by force during bending of the straw.

The Letter Patents, **GB-A-1 219 595** (UNION CARBIDE  
5 CORP. – 20 January 1971) and **US-A-3 641 884** (JIVOIN –  
15 February 1972) refer to properties of the common,  
straight, flexible drinking straws of general use.

No mention is made to straws which are attached to the  
10 packaging of fruit juices, milks, coffees etc. and are  
permanently bent until their use. Besides, approximately 28  
years have lapsed since then but no one has thought of some  
of the recommended innovations.

15 The advantage of the present invention is that it attains  
complete straightening up and functionality of the straw  
without a significant increase in the production cost and  
without major changes in the current production line.

20 **FIG. 1** shows indicatively a straw in bent position, with  
one flexible zone having certain rings folded.

To assist straightening up of the straw, when all its rings  
are expanded after bending (like the case is until today), the  
25 straw must have sufficient rings (more than ten), so that  
when it bends, the rings are not deformed by force.

Further, the straw should not be under any form of  
external pressure. Therefore the straw, after bending, is let  
30 free to remain bent at the desired angle without external

pressure. Following this it can be packed in its final form.

If, in any way, more rings are expanded, than those  
5 needed to bent the straw to the desired angle, then the extra  
expanded rings lose their flexibility as the time passes and  
do not bend to any direction.

To achieve the best possible straightening up and  
10 functionality of the straw, even if stored for an extensive  
period, there have to be sufficient rings so that after bending  
of the straw, certain rings remain folded without, of course,  
deformation of the expanded rings in a forceful way.

15 We aim at keeping the first rings (1) folded (e.g. 2-4 first  
rings) so that after straightening, the straw may bend to all  
directions thanks to the folded rings.

Straightening of the straw is considerably assisted by the  
20 existence of interspersed folded rings among the expanded  
ones, as well as around the middle of the arch formed by  
bending of the straw, so that not many consecutive expanded  
rings exist without interference of one (3) or more (4) folded  
ones, particularly at the middle of the arch, where the biggest  
25 amount of pressure is exercised [e.g. an expanded ring (2) is  
followed by a folded ring (3)].

In order definite rings remain folded, apart from their  
number certain other factors are of importance as well, like  
30 the material, point (or points) at which pressure is exerted to

bend the straw, the shape and the position of fulcrum (or fulcrums) etc. (e.g. The pressure is applied on a fixed point and the position of the fulcrum changes as the straw bends).

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As there exist extra rings, it is difficult for them to be deformed by force. For full scale application of the recommended changes there have to be sufficient rings (many more than ten folding rings).

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In order the straw is not under any form of external pressure after bending, it is let free to remain bent at the desired angle without external pressure. Following this, it can be packed in its final form.

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If something goes wrong in bending and some consecutive rings unfold (5) or some of the first rings unfolds this is not a serious problem and the straw straightens again (usually without any particular effort), because:

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1. The rings are not deformed by force.
2. There will always be enough folded rings to support straightening of the expanded ones.

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With the presence of folded rings, after bending of the straw, we can increase its effective length as well, because when it straightens and all rings are unfolded, it can bend, if we wish, at the first rings and the remaining section stays  
30 straight and larger than respective section of the usual

straws.

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In case the straw has more than one flexible zones  
5 (corrugated zones) consisting of folding rings (annular  
bellows folds, reentrant overlapping folds) [e.g. the S-shaped  
straws – **EP-A-0 327 244** (ELOPAK SYSTEMS AG)] the  
above are applied on all zones.